

Critical Thinking

- 14-23 Derive the value of $1.26 \times 10^{-9} \text{ T/(A}\cdot\text{t/m)}$ for μ_0 from $\mu = B/H$.
- 14-24 What is the relative permeability (μ_r) of a piece of soft iron whose permeability (μ) equals $3.0 \times 10^{-3} \text{ T/(A}\cdot\text{t/m)}$?
- 14-25 Refer to Fig. 14-23a. Calculate (a) the total wire resistance R_w of the No. 12 gage copper wires; (b) the total resistance R_T of the circuit; (c) the voltage available across the load R_L ; (d) the I^2R power loss in the wire conductors; (e) the load power P_L ; (f) the total power P_T consumed by the circuit; (g) the percent efficiency of the system calculated as $(P_L/P_T) \times 100$.
- 14-26 Refer to Fig. 14-23b. Calculate (a) the total wire resistance R_w of the No. 20 gage copper wires; (b) the total resistance R_T of the relay coil circuit; (c) the

- voltage across the relay coil; (d) the IR power loss in the No. 20 gage copper wires in the relay coil circuit; (e) the total wire resistance R_w of the 10-ft length of No. 12 gage copper wires that connect the 16- Ω load R_L to the 240-Vac power line; (f) the voltage available across the load R_L ; (g) the IR power loss in the 10-ft length of the No. 12 gage copper wire; (h) the load power P_L ; (i) the total power P_T consumed by the load side of the circuit; (j) the percent efficiency of the system calculated as $(P_L/P_T) \times 100$.
- 14-27 Explain the advantage of using a relay rather than an ordinary mechanical switch when controlling a high power load a long distance away. Use your solutions from Critical Thinking Probs. 14-25 and 14-26 to support your answer.

- 14-12 Convert the following values of field intensity to A/t/m.
- a. 50 A/t/m.
b. 150 A/t/m.
- 14-11 Convert the following values of field intensity to oersteds:
- a. 50 A/t/m.
b. 150 A/t/m.
- 14-10 Calculate the field intensity, H , in ampere-turns per meter, for each of the following cases:
- a. $I = 40 \text{ mA}$, $N = 500$ turns, $l = 0.2 \text{ m}$.
b. $I = 100 \text{ mA}$, $N = 1000$ turns, $l = 0.5 \text{ m}$.
c. $I = 60 \text{ mA}$, $N = 600$ turns, $l = 0.25 \text{ m}$.
d. $I = 10 \text{ mA}$, $N = 300$ turns, $l = 0.075 \text{ m}$.
- 14-9 Calculate the field intensity, H , in ampere-turns per meter, for each of the following cases:
- a. $\text{mmf} = 100 \text{ A}\cdot\text{t}$, $l = 0.2 \text{ m}$.
b. $\text{mmf} = 25 \text{ A}\cdot\text{t}$, $l = 0.25 \text{ m}$.
c. $\text{mmf} = 4 \text{ A}\cdot\text{t}$, $l = 0.08 \text{ m}$.
d. $\text{mmf} = 20 \text{ A}\cdot\text{t}$, $l = 0.1 \text{ m}$.
- 14-8 What is (a) the cgs unit of field intensity? (b) the SI unit of field intensity?
- SECTION 14-2 FIELD INTENSITY (H)

- 14-13 Convert the following values of mmf to gilberts (Gb):
- a. 100 A-t.
b. 30 A-t.
c. 500 A-t.
- 14-7 Convert the following values of mmf to ampere-turns (A-t):
- a. 126 Gb.
b. 37.8 Gb.
c. 630 Gb.
- 14-14 A coil with an iron core has a field intensity, H , of 50 A-t/m. If the relative permeability, μ_r , equals 300, calculate the flux density, B , in teslas.
- 14-15 Calculate the relative permeability, μ_r , of an iron core when a field intensity, H , of 750 A-t/m produces a flux density, B , of 0.126 T.
- 14-16 Calculate the field intensity, H , of an electromagnet the flux density, B , equals 0.504 teslas and the relative permeability of the core is 200.
- SECTION 14-3 B-H MAGNETIZATION CURVE
- 14-17 Referring to the B-H curve in Fig. 14-3, calculate the absolute permeability, μ , in SI units for the iron core a field intensity, H , of
- a. 3000 A-t/m.
b. 5000 A-t/m.
- SECTION 14-9 GENERATING AN INDUCED VOLTAGE
- 14-18 A magnetic field cuts across a coil of 500 turns at the rate of 100 $\mu\text{Wb/s}$. Calculate v_{ind} .
- 14-19 A magnetic field cuts across a coil of 400 turns at the rate of 0.02 Wb/s. Calculate v_{ind} .
- 14-20 A magnetic flux of 300 Mx cuts across a coil of 1500 turns in 200 μs . Calculate v_{ind} .
- 14-21 The magnetic flux surrounding a coil changes from 1000 to 6000 Mx in 5 μs . If the coil has 200 turns, how much is the induced voltage?
- 14-22 A coil has an induced voltage of 1 kV when the rate of flux change is 0.5 Wb/s. How many turns are in the coil?